

Beyond solids and liquids: the science of slime

Activity 3: Materials challenge

Viscoelasticity of materials

By simply observing the materials in our surroundings, we can discern their distinct resistance to external forces and observe their diverse levels of deformability under different rates of stress. To gain a comprehensive understanding of a material's behaviour and design new materials, it is essential to explore its viscoelastic response. The following questions should be considered. Does the material flow in a tube with no effort? Does it resist when I hit it? Is it easy to scratch it? Should it be soft to be used safely in an everyday environment?

For example, toothpaste needs to be soft to flow out of the tube and should not scratch your teeth, cakes need to reach a good balance between softness and stability (it should not collapse), and shoe components need to be rigid enough to protect your feet but also soft to make shoes comfortable. These are just few examples of the balance of properties that needs to be achieved.

However, few materials demonstrate the intriguing combination of deformability and shape recovery, alongside the ability to both flow and bounce. These remarkable viscoelastic properties make slime particularly fascinating.

After the experience acquired testing different slime formulations, your group is requested to provide two materials suitable for different applications:

- **Jelly sauce:** for a food application, a jelly sauce should be pourable from a container with a small opening.
- **Bouncing ball:** for a fun application, a ball of material should bounce as high as possible.

Procedure

After agreeing on the experimental procedure with your classmates, you will have 60 minutes to produce, test, and refine your formulation to provide the one that will be tested in the final competition.

Hint: you can start testing the materials from Activity 2 (and check the materials assessment tables for those materials) as a starting point for your own recipe.